Lumen Christi Catholic College – ASSESMENT TASK
Year 12 General Mathematics
TASK 1 Application of Surface Area and Volume and Spherical Geometry
In class assignment 10%
Teachers: Mr Flavell
Mr Watters
Mr Smith

Name: _____

DIRECTIONS:

- Write using lead pencil, blue or black pen
- Answer on the test paper in the spaces provided
- Board approved calculators may be used
- Logical justification should be given
- **TOTAL MARKS : 48**
- Attempt all questions

Mark:

Task Rank:

Course Rank:

Applications of Surface Area and Volume (16 marks)

Question 1

Lulu is having her bedroom carpeted. Carpet costs $89.50 per m^2 to buy and have it laid. She bedroom is rectangular with a length of 4.1 m and a width of 3.9 m.

a) Calculate the area of Lulu's floor in her bedroom.

/1

b) Calculate the cost of carpeting Lulu's bedroom. Answer to the nearest dollar.

/1

Question 2

Neatly sketch the net of the following solid. It is a square based pyramid)

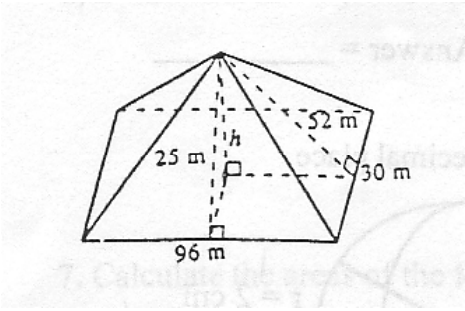
Net:
(not to scale)

/1

Question 3

Calculate the surface area of the following

a)



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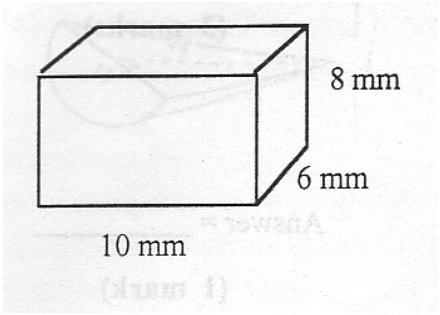
b)



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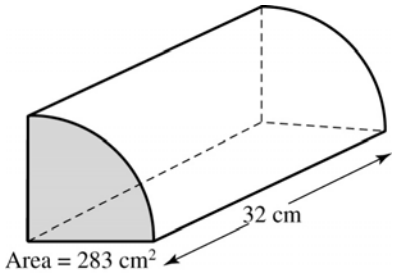
Question 4

Calculate the volume of the following solids: (answer to the nearest whole number)

a)



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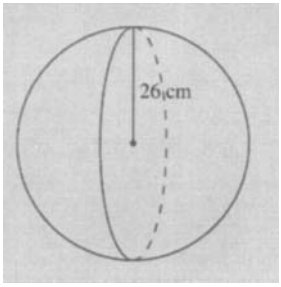
b)



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Question 5

A swimming pool is 1m at the shallow end and 2.1m at the deep end. The floor of the pool is a constant slope. If the pool is 50m long and 25m wide, calculate the volume of the pool.

/3

Question 6

A single <u>cylinder</u> motor has a bore (diameter) of 8cm and a stroke (height) of 10cm.

a) Calculate the volume of the motor in cm^3. Answer to the nearest 10.

/2

b) Given $1000cm^3$ is equal to 1 litre, find the capacity of the motor.

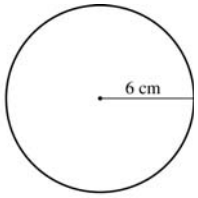
/1

Spherical Geometry (32marks)

Section A Multiple Choice (All questions worth 1 mark each)

Question 1

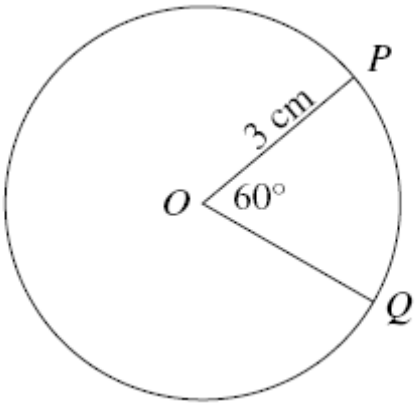
The circumference of the following circle is: (answer correct to 2 decimal places)



(A) 18.85 (B) 37.70 (C) 113.10 (D) 452.39

Question 2

P and *Q* are points on the circumference of a circle with centre *O* and radius 3cm.



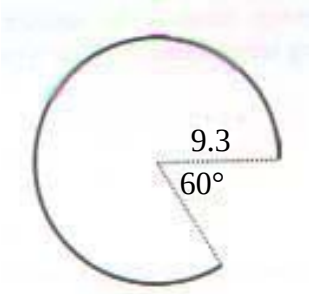
NOT
TO
SCALE

Calculate the length of the smaller arc *PQ*, in centimetres, correct to three significant figures.

(A) 1.57 (B) 3.14 (C) 4.71 (D) 18.8

Question 3

The diagram shows a circle of radius 9.3 cm. A sector of angle 60° has been cut from the circle. Which of the following expressions gives the length of the circular **arc which remains?**



(A) $\frac{60}{360}\times\pi\times9.3^2$

(B) $\frac{60}{360}\times2\times\pi\times9.3$

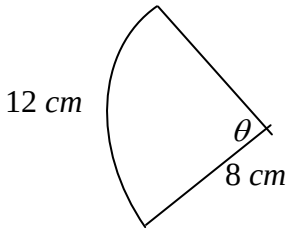
(C) $\frac{300}{360}\times\pi\times9.3^2$

(D) $\frac{300}{360}\times2\times\pi\times9.3$

Question 4

The sector shown has an arc length of 12 *cm* and radius 8 *cm*. The angle θ is closest to

NOT TO SCALE



(A) 43^0 (B) 86^0 (C) 90^0 (D) 172^0

Question 5
Kim lives in Perth (32°S, 115°E). He wants to watch an ice hockey game being played in Toronto (44°N, 80°W) starting at 10.00pm on Wednesday.

What is the time in Perth when the game starts?

(A) 9.00 am on Wednesday

(B) 7.40 pm on Wednesday

(C) 12.20am on Thursday

(D) 11.00am on Thursday

Question 6
Moranbah has latitude 22°S and longitude 148°E. Mitchell is due south of Moranbah. Which of the following could be the latitude and longitude of Mitchell?

(A) 18°S 148°E

(B) 22°S 144°E

(C) 22°S 152°E

(D) 26°S 148°E

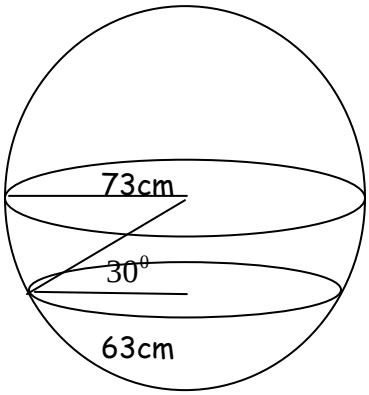
Section B Short Answer (Questions are worth different marks accordingly)

Question 1

A satellite orbits the earth at an altitude of 12 000 km. If the radius of the earth is 6400 km, find the circumference of the orbit. Answer to the nearest 100 km. (Hint: Draw a diagram)

/2

Question 2



(a) Calculate the circumference of the great circle around the above sphere. Answer correct to three significant figures

/2

(b) Calculate the circumference of the small circle around the above sphere. Answer correct to 2 decimal places

/2

Question 3
Darwin is approximately (13°S, 132°E) and a point on the Great Australian Bight is approximately (32°S, 132°E).

(a) Calculate the angular distance between them.

/1

(b) Use the arc length formula to calculate the distance between these two points. Answer to the nearest 100km. Use r=6400km.

/2

Question 4
Calculate the time difference in hours between:

a) Perth (GMT +8) and Fiji (GMT +12)

b) Sydney (GMT +10) and New York (GMT -3)

c) Los Angeles (GMT -8) and Jamaica (Maaann!!!) (GMT -3)

/3

Question 5
The local time in Sydney is GMT + 10 while the local time in Los Angeles is GMT – 8. What is the local time in Sydney when it is 3:00pm Tuesday in Los Angeles?

/2

Question 6
A plane is flying from Sydney (GMT +10) to Paris (GMT +1).

a) Calculate the time difference between Sydney and Paris.

/1

b) The flight takes 15 hours and the plane departs Sydney at 3pm (EST) on Friday. At **what time** and on **what day** will the plane land in Paris, local standard time?

/2

Question 7
Mr Watters is on holiday in Madagascar (25°S, 45°E). He wants to phone Mrs Watters, who is in Italy (45°N, 15°E).

a) Find the difference in standard time between Madagascar and Italy.

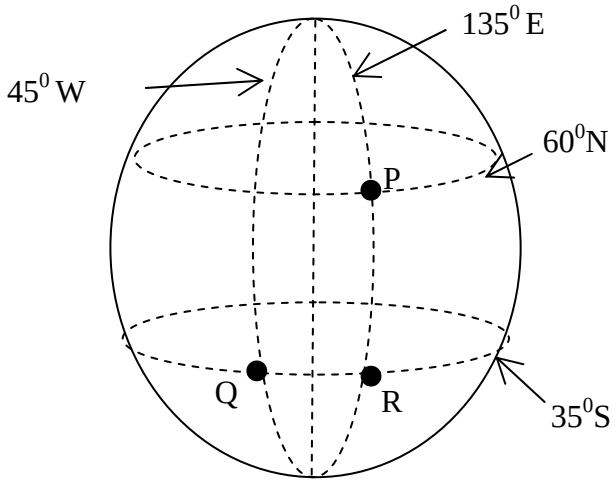
/1

b) At what time and on what day must Mr Watters place the call from Madagascar if he wants to call Mrs Watters at 11.30pm on Monday, Italian time?

/2

Question 8

The diagram represents the Earth with three points P, Q and R on the surface.
(NOTE: For this question, assume r = 6400 km and 1° = 60M)



NOT TO SCALE

a) State the coordinates of P and Q.

/2

b) Show that the angular distance between P and R is 95^0.

/1

c) Show that the distance in nautical miles between P and R is 5700M.

/1

d) A ship sails from P to R at an average speed of 30 knots. How long will the journey take? Give your answer in days and hours.

/2

END OF TEST

General Mathematics

FORMULAE SHEET

Area of an annulus

$A = \pi\left(R^2 - r^2\right)$

R = radius of outer circle

r = radius of inner circle

Area of an ellipse

$A = \pi ab$

a = length of semi-major axis

b = length of semi-minor axis

Area of a sector

$A = \dfrac{\theta}{360}\pi r^2$

θ = number of degrees in central angle

Arc length of a circle

$l = \dfrac{\theta}{360}2\pi r$

θ = number of degrees in central angle

Simpson's rule for area approximation

$A \approx \dfrac{h}{3}\left(d_f + 4d_m + d_l\right)$

h = distance between successive measurements

d_f = first measurement

d_m = middle measurement

d_l = last measurement

Surface area

Sphere $A = 4\pi r^2$

Closed cylinder $A = 2\pi rh + 2\pi r^2$

r = radius

h = perpendicular height

Volume

Cone $V = \dfrac{1}{3}\pi r^2 h$

Cylinder $V = \pi r^2 h$

Pyramid $V = \dfrac{1}{3}Ah$

Sphere $V = \dfrac{4}{3}\pi r^3$

r = radius

h = perpendicular height

A = area of base

Sine rule

$\dfrac{a}{\sin A} = \dfrac{b}{\sin B} = \dfrac{c}{\sin C}$

Area of a triangle

$A = \dfrac{1}{2}ab\sin C$

Cosine rule

$c^2 = a^2 + b^2 - 2ab\cos C$

or

$\cos C = \dfrac{a^2 + b^2 - c^2}{2ab}$

FORMULAE SHEET

Simple interest

$I = Prn$

P = initial quantity
r = percentage interest rate per period, expressed as a decimal
n = number of periods

Compound interest

$A = P(1+r)^n$

A = final balance
P = initial quantity
n = number of compounding periods
r = percentage interest rate per compounding period, expressed as a decimal

Future value (A) of an annuity

$$A = M\left\{\frac{(1+r)^n - 1}{r}\right\}$$

M = contribution per period, paid at the end of the period

Present value (N) of an annuity

$$N = M\left\{\frac{(1+r)^n - 1}{r(1+r)^n}\right\}$$

or

$$N = \frac{A}{(1+r)^n}$$

Straight-line formula for depreciation

$S = V_0 - Dn$

S = salvage value of asset after n periods
V_0 = purchase price of the asset
D = amount of depreciation apportioned per period
n = number of periods

Declining balance formula for depreciation

$S = V_0(1-r)^n$

S = salvage value of asset after n periods
r = percentage interest rate per period, expressed as a decimal

Mean of a sample

$$\bar{x} = \frac{\sum x}{n}$$

$$\bar{x} = \frac{\sum fx}{\sum f}$$

$\bar{x}$ = mean
x = individual score
n = number of scores
f = frequency

Formula for a z-score

$$z = \frac{x - \bar{x}}{s}$$

s = standard deviation

Gradient of a straight line

$$m = \frac{\text{vertical change in position}}{\text{horizontal change in position}}$$

Gradient–intercept form of a straight line

$y = mx + b$

m = gradient
b = y-intercept

Probability of an event

The probability of an event where outcomes are equally likely is given by:

$$P(\text{event}) = \frac{\text{number of favourable outcomes}}{\text{total number of outcomes}}$$